



Seri
Ilmuwan Muslim
yang Dikagumi Dunia

lu^xima

AL-BIRUNI

Guru Segala Ilmu

BILINGUAL
INDONESIA
INGGRIS

AL-BIRUNI
Master of
All Sciences

YOLI HEMDI

EDISI
LENGKAP
Untuk
Anak





Seri
Ilmuwan Muslim
yang Dikagumi Dunia



AL-BIRUNI

Guru Segala Ilmu

AL-BIRUNI
Master of All Sciences

YOLI HEMDI

lu^xima

Al-Biruni *Guru Segala Ilmu*

Penulis : Yoli Hemdi
Editor : Aang S. DMP.
Penerjemah : Nur Lailatur Rofiah
Ilustrator : Joy Subarjah, Yusuf M. Suriawinata
Layouter : Edi Laish
Desain Cover : Muchlis Umar

ISBN: 978-602-268-333-9

ISBN (E): 978-602-268-476-3

Hak cipta dilindungi undang-undang

Cetakan I: Januari 2019

Diterbitkan oleh:



PT Luxima Metro Media

Kantor Operasional:

Jalan Kalisari III No. 28A, Pasar Rebo, Jakarta Timur 13790

Telp. 021-29378394; Faks. 021-29378394

Email: luxima_media@yahoo.co.id

Website: www.penerbitluxima.co.id

Sanksi Pelanggaran Pasal 72 :

Undang-Undang No. 19 Tahun 2002, tentang Hak Cipta :

- (1) Barang siapa dengan sengaja dan tanpa hak melakukan perbuatan sebagaimana dimaksud dalam Pasal 2 ayat (1) atau Pasal 49 ayat (1) dan ayat (2) dipidana dengan pidana penjara masing-masing paling singkat 1 (satu) bulan dan/ atau denda paling sedikit Rp 1.000.000,- (satu juta rupiah), atau pidana penjara paling lama 7 (tujuh) tahun dan/ atau denda paling banyak Rp 5.000.000.000,- (lima miliar rupiah).
- (2) Barang siapa dengan sengaja menyiarkan, memamerkan, mengedarkan, atau menjual kepada umum suatu ciptaan atau barang hasil pelanggaran Hak Cipta atau Hak Terkait sebagaimana dimaksud pada ayat (1) dipidana dengan pidana penjara paling lama 5 (lima) tahun dan/ atau dengan denda paling banyak Rp 500.000.000,- (lima ratus juta rupiah).

Kata Pengantar

Orang-orang akan bingung bagaimana cara menyebut keahlian Al-Biruni. Ada yang mengatakan Al-Biruni ahli astronomi atau angkasa luar. Namun dia juga ahli farmasi, geodesi, fisika, matematika, sejarah, agama, dan lain-lain. Hebatnya lagi, di setiap bidang keilmuan itu dia selalu membuat karya yang bagus. Hasil karyanya pun masih terus dipakai hingga sekarang.

Pantaslah bila Al-Biruni dijuluki Guru Segala Ilmu karena banyaknya bidang keilmuan yang dikuasainya. Sulit sekali mencari ilmuwan lain yang dapat menandingi kecerdasannya. Sejak kecil, ia sangat rajin belajar. Al-Biruni menguasai berbagai bahasa sehingga dia dapat belajar kepada guru yang berbeda-beda bahasanya. Dia pun bisa membaca banyak buku dengan bahasa yang berbeda-beda.

Al-Biruni adalah teladan bagi kita semua karena dia memanfaatkan ilmunya untuk agama. Dia menunjukkan arah kiblat yang benar di ratusan kota yang dilaluinya. Al-Biruni juga seorang ilmuwan yang saleh dan taat menjalankan agamanya.

Selamat membaca!

Salam,
Kak Yoli



Daftar Isi

Table of Contents

Prakata _iii

Preface

Daftar Isi _iv

Table of Contents

Perjalanan Menjadi Ilmuwan _1

Journey to Become a Scientist

Merantau Ke India _10

Wandering to India

Ahli Astronomi _15

Astronomer

Metode Eksperimen _20

Experimental Method

Keliling Bumi _26

The Circumference of Earth

Matematika dan Fisika _33

Mathematics and Physics

Guru Segala Ilmu _38

Master of All Sciences

Daftar Pustaka _43

Bibliography

Perjalanan Menjadi Ilmuwan

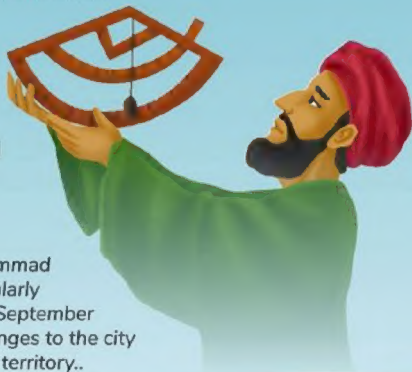
Journey to Become a Scientist


Namanya Abu al-Raihan Muhammad bin Ahmad al-Biruni. Dia lebih populer dengan sebutan Al-Biruni. Ia lahir pada 4 September 973 M di Kath. Sekarang namanya berganti dengan kota Khiva. Kini termasuk wilayah negara Uzbekistan.

Nama Al-Biruni berasal dari kata Birun. Dalam bahasa Persia, Birun artinya pinggir kota, karena kampung kelahirannya berada di daerah pinggir kota.

His name is Abu al-Raihan Muhammad bin Ahmad al-Biruni. He is more popularly known as Al-Biruni. He was born on September 4, 973 AD in Kath. Now its name changes to the city of Khiva. Now it is part of Uzbekistan territory..

The name of Al-Biruni comes from the word Birun. In Persian, Birun means suburbs, because the village of his birth is in the suburban area.



An illustration of two men in traditional Islamic attire. On the left, an older man with a beard and a red turban, wearing a green robe, sits on a red and yellow patterned rug. He is looking down at an open book held by a younger man. The younger man, also with a red turban and wearing a blue robe with yellow sleeves, is kneeling and reading the book. In the background, there is a grey wall and a green bush. A black vertical pole is visible on the far left.

Sejak kecil, Al-Biruni mempelajari ilmu keislaman dengan baik. Selain mempelajari bahasa Arab, dia juga mendalami bahasa Persia karena itu adalah bahasa kampung halamannya. Al-Biruni juga mahir bahasa Yunani, Suryani, Sanskerta, dan Iberia.

Selain menunjukkan kecerdasan bahasa yang luar biasa, Al-Biruni juga cerdas dalam ilmu pengetahuan alam. Di kampungnya, Dia belajar astronomi dan matematika. Gurunya bernama Abu Nashar Manshur.

Since childhood, Al-Biruni studied Islamic science well. Besides learning Arabic, he also learning Persian because it was the language of his hometown. Al-Biruni was also fluent in Greek, Syriac, Sanskrit and Iberian.

Apart of showing an extraordinary language intelligence, Al-Biruni was also intelligent in natural science. In his village, he studied astronomy and mathematics. His teacher was Abu Nashar Mansur.

Al-Biruni seorang anak yatim piatu. Namun, ia bukanlah seorang yang lemah. Semangat belajarnya sangat luar biasa karena Al-Biruni sangat mencintai ilmu pengetahuan.

Selain berguru kepada Ibnu Ali Ibnu Iraqi dan Syekh Abdus Shamad, Al-Biruni juga belajar pada Abu al-Wafa al-Buzayani. Dia mempelajari ilmu pasti dan astronomi. Dalam usia muda pula ia mendalami ilmu kedokteran.

Al-Biruni was an orphan. However, he was not a weak person. His spirit of learning was extraordinary because Al-Biruni loved science.

Apart of studying to Ibn Ali Ibn Iraqi and Syekh Abdus Shamad, Al-Biruni also was also studying with Abu al-Wafa al-Buzayani. He studied science and astronomy. At a young age he also studied medicine.

Banyak orang tercengang melihat kemajuan ilmu Al-Biruni. Apa rahasianya dalam belajar? Itu karena Al-Biruni menguasai banyak bahasa. Bahkan, ia menguasai bahasa-bahasa yang langka.

Al-Biruni bisa membaca berbagai jenis buku. Dia tidak kesulitan membaca buku dengan bahasa berbeda-beda. Hal ini bisa memudahkannya berguru kepada siapa saja, meskipun bahasanya berbeda-beda.

Many people were astonished to see the progress of Al-Biruni's science. What is the secret in his learning? That's because Al-Biruni mastered many languages. In fact, he mastered the rare languages.

Al-Biruni could read various types of books. He had no trouble reading books in different languages. This could make him easier to learn from everyone, even though the language was different.

Pada usia muda, Al-Biruni menyadari pentingnya berpetualang. Dengan berpetualang dia akan memperoleh lebih banyak ilmu. Akhirnya, Dia pun berani meninggalkan kampung halamannya.

Dia memulai perjalanan pada usia 20 tahun. Selama tiga tahun Al-Biruni berpindah-pindah daerah. Ternyata petualangan itu sangatlah seru. Di manapun berada, ia terus mencari guru untuk belajar.

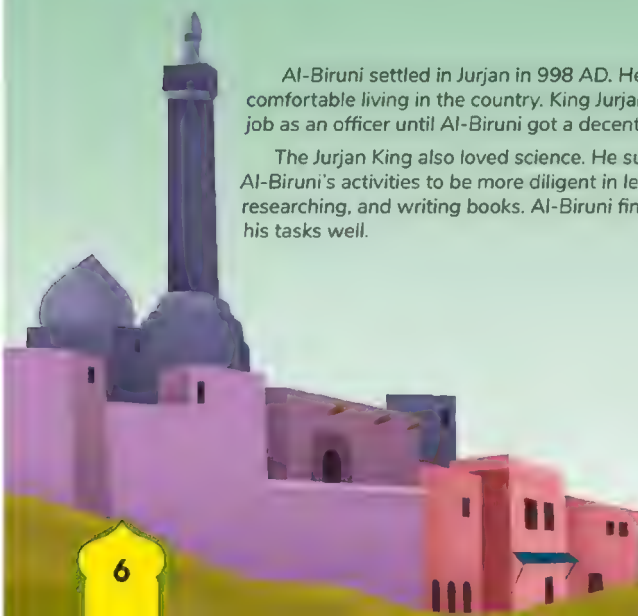
At a young age, Al-Biruni realized the importance of adventure. By adventuring he would gain more knowledge. Finally, he dared to leave his hometown.

He started his journey at the age of 20. For three years Al-Biruni moved from one area to another. It turned out that the adventure was very exciting. Wherever he went, he continued to look for teachers to learn.



Al-Biruni menetap di Jurjan pada tahun 998 M. Dia merasa betah tinggal di negeri tersebut. Raja Jurjan memberinya pekerjaan sebagai pegawai sehingga Al-Biruni mendapatkan sumber penghasilan yang layak.

Penguasa Jurjan juga mencintai ilmu pengetahuan. Dia mendukung kegiatan Al-Biruni agar semakin rajin belajar, meneliti, dan menulis buku. Al-Biruni pun akhirnya dapat menyelesaikan tugas-tugasnya dengan baik.



Al-Biruni settled in Jurjan in 998 AD. He felt comfortable living in the country. King Jurjan gave him the job as an officer until Al-Biruni got a decent living.

The Jurjan King also loved science. He supports Al-Biruni's activities to be more diligent in learning, researching, and writing books. Al-Biruni finally completed his tasks well.


Banyak kebaikan yang diperolehnya di Istana Jurjan. Salah satunya Al-Biruni bertemu ilmuwan Ibnu Sina. Dia adalah ilmuwan hebat yang digelar bapak kedokteran dunia. Ibnu Sina juga mendapat perlindungan di Jurjan.

Keduanya akhirnya berteman baik dan menjadi teman diskusi yang menyenangkan. Mereka saling mendukung dalam ilmu pengetahuan.

There are many goodness he has earned in Jurjan's palace. One of them was Al-Biruni met Ibn Sina, the scientist. He was a great scientist who has been known as the father of medicine. Ibn Sina also received protection from Jurjan.

Both eventually became good friends and became a fun discussion partner. They supported each other in science.



An illustration of a man with a beard and a red turban, wearing a green robe, sitting at a wooden desk and writing in a book with a quill. On the desk are other books, including one with a pink cover. The background is a dark, starry night sky with a large crescent moon and a ringed planet like Saturn. A green curtain is visible on the left side of the frame.

Di sanalah terbit buku Al-Biruni yang terkenal berjudul Al-Atsar al-Baqiyah min al-Qurun al-Khaliyah. Buku itu membahas sejarah bangsa-bangsa kuno dan perbedaan kalender berbagai bangsa.

Buku ini juga mengkaji sejarah ilmu pengetahuan, astronomi, sistim hukum, politik, budaya. serta menjelaskan kemajuan bangsa-bangsa kuno.

A famous Al-Biruni's book was issued there entitled Al-Atsar al-Baqiyah min al-Qurun al-Khaliyah. The book studied about the history of ancient nations and the different calendar of the various nations.

This book also examined the history of science, astronomy, legal systems, politics, and culture. as well as explaining the progress of ancient nations.

Setelah lama di rantau, akhirnya Al-Biruni pulang kampung. Dia kembali ke Khawarizmi tahun 1010 M. Raja Abu Abbas al-Makmun menerimanya dengan senang hati. Al-Biruni pun mendapatkan pekerjaan di istana. Raja mengizinkannya terus meneliti dan berkarya.

Sayangnya kerajaan itu sedang kacau oleh masalah keamanan. Bahkan, sang raja mati terbunuh. Kerajaan Ghaznawi dari Afghanistan kemudian datang menyerbu. Selanjutnya, Mahmud Ghaznawi menjadi penguasa di sana.

After a long time wandering, Al-Biruni finally returned home. He returned to Khawarizmi in 1010 AD. King Abu Abbas al-Makmun accepted him gladly. Al-Biruni also got a job at the palace. The King allowed him to continue doing research and working.

Unfortunately the kingdom was being chaotic by security issues. In fact, the king was killed. The kingdom of Ghaznawi from Afghanistan later came to invade. Furthermore, Mahmud Ghaznawi became the ruler there.

Merantau Ke India

Wandering to India

Kecerdasan Al-Biruni membuat Mahmud Ghaznawi kagum. Sang raja sangat menghormati ilmuwan. Bahkan, Al-Biruni diajaknya ikut serta ke India. Saat itu India termasuk wilayah kerajaan Ghaznawi.

Kecerdasan bahasa membantu Al-Biruni mengembangkan ilmu. Dengan cepat ia menguasai bahasa Sanskerta di India. Dia terjemahkan buku-buku berbahasa Sanskerta ke bahasa Arab. Dia pun menerjemahkan buku-buku bahasa Arab ke

Sanskerta sehingga terjadilah perpaduan ilmu di Arab dengan India.

Luar biasa semangat Al-Biruni mempelajari India sehingga berhasil menyelesaikan buku Tarikh al-Hindi. Ini adalah karya terbaik ilmuwan muslim tentang sejarah India. Buku ini menjelaskan falsafah hidup orang-orang India.

Buku ini menerangkan geografi dengan jelas dan membahas peradaban bangsa India. Sampai sekarang, buku ini terus menarik perhatian ilmuwan. Siapapun yang ingin memahami India perlu membaca buku ini.

Al-Biruni's intelligence made Mahmud Ghaznawi amazed. The king was very respectful of the scientists. In fact, Al-Biruni was invited to join to India. At that time India was part of the Ghaznawi kingdom.

Language intelligence helped Al-Biruni develop the knowledge. He quickly mastered Sanskrit in India. He translated Sanskrit books into Arabic. He also translated Arabic books into Sanskrit so that there was a combination of knowledge in Arabic with India.

The spirit of Al-Biruni to study India was incredible until he succeeded in completing the book Tarikh al-Hindi. This was the best work of Muslim scientist on the history of India. This book explained the philosophy of Indian people life.

This book explained the geography clearly and discussed Indian civilization. Until now, this book continued to attract the attention of scientists. Anyone who wants to understand India needs to read this book.

Al-Biruni berhasil meneliti jenis-jenis partikel tanah. Dia melakukan pengamatan di Sungai Gangga sehingga mampu menjelaskan proses pembentukan tanah. Al-Biruni pun membuat rumusan teori erosi.

Petualangannya sampai ke pegunungan Himalaya. Dengan cermat Al-Biruni menemukan siput dan kerang laut. Sungguh menakjubkan ada fosil hewan laut di pegunungan. Al-Biruni menelitinya dengan hati-hati.

Al-Biruni succeeded in doing research on the types of soil particles. He made observations on the Ganges River so that he could explain the process of soil formation. Al-Biruni then formulated the theory of erosion.

His adventure reached the Himalayas. Al-Biruni carefully found snails and sea shells. It's amazing that there are fossils of marine animals in the mountains. Al-Biruni examined it carefully.


Al-Biruni kemudian mengetahui pegunungan Himalaya dulunya lautan. Namun pertemuan dan pergerakan kulit bumi membuatnya naik hingga akhirnya menjadi pegunungan. Oleh karena itu, banyak ditemukan fosil hewan laut di sana.

Ilmuwan modern membuktikan kebenaran pendapat Al-Biruni. Sekarang ilmuwan menemukan pergerakan tanah atau kulit bumi. Itulah yang membuat terbentuknya pegunungan. Padahal dahulunya berada di dasar lautan.

Al-Biruni later learned that the Himalayas were once an ocean. But the meeting and movement of the earth's skin made it rise and finally became a mountain. Therefore, there were many fossils of marine animals there.

Modern scientists prove the truth of Al-Biruni's opinion. Now scientists discover the movement of soil or earth's crust. That what makes the mountains. Whereas it used to be at the bottom of the ocean.



An illustration of Al-Biruni, a bearded man with a red turban and green robe, sitting at a wooden desk. He is looking down at a small object in his hands. On the desk, there is a lit oil lamp and a small bowl. In the background, there is a large arched window with a blue curtain on the left side. The overall scene is set in a room with light green walls.

Dia juga menunjukkan perhatian terhadap logam dan permata. Al-Biruni meneliti dengan baik jenis-jenis dan sifat-sifat logam. Dia mengetahui bagaimana proses pembentukannya.

Al-Biruni mencatat penelitiannya dengan rapi. Bahkan, dia menulis buku tentang permata. Batu berharga itu terbentuk melalui proses yang menarik. Dari sanalah dunia memahami batu berharga itu. Al-Biruni menjelaskan keistimewaan permata.

He also showed concern for metals and gems. Al-Biruni researched the types and properties of metals. He knows how to form it.

Al-Biruni recorded his research neatly. Even, he wrote a book about gems. The precious stone is formed through an interesting process. That's where the world understands the precious stone. Al-Biruni explains the features of gems.

Ahli Astronomi

Astronomer

Sepulangnya dari India, Al-Biruni menyiapkan hadiah besar. Hadiah itu akan diserahkan kepada Sultan Mas'ud al-Ghaznawi. Dia menyiapkan kejutan yang lebih dahsyat dari emas permata.

Pada 1030 M, Al-Biruni menulis sebuah buku bagus. Judul bukunya Al-Qanun al-Masudi fii al-Haiwa al-Nujum. Isinya tentang pengetahuan teorama trigonometri. Buku itu juga menjelaskan astronomi, solar, lunar, dan planet.

Upon returning from India, Al-Biruni prepared a big prize. The prize will be handed over to Sultan Mas'ud al-Ghaznawi. He prepared a surprise which more powerful than gold gems.

In 1030 AD, Al-Biruni wrote a good book. The title of his book is Al-Qanun al-Masudi fii al-Haiwa al-Nujum. Its contents are about knowledge of trigonometry teorama. The book also explains astronomy, solar, lunar and planet.



Hadiah buku itu diterima Sultan Mas'ud dengan suka cita. Sebelumnya sultan sering bertanya tentang langit. Dia penasaran dengan planet-planet.

Al-Biruni mencatat semua pertanyaan itu dengan baik, kemudian jawaban lengkapnya ditulis oleh Al-Biruni. Akhirnya, jadilah buku setebal kira-kira 1.500 halaman. Sultan pun sangat senang membacanya.

The gift of the book was received by Sultan Mas'ud with joy. Previously the sultan often asked about the sky. He was curious about the planets.

Al-Biruni recorded all these questions well, then the complete answer was written by Al-Biruni. Finally, it became a book of 1,500 pages thick. The Sultan was very happy to read it.

Sultan Mas'ud sangat berterima kasih. Al-Biruni pun diberi hadiah koin perak. Hadiah yang diberikan sultan sangat banyak. Bahkan, dibutuhkan gajah untuk membawa hadiah itu. Namun Al-Biruni menolaknya.

"Maaf, sebaiknya koin perak diserahkan ke Baitul Mal," katanya. "Kenapa?" tanya Sultan.

Sultan Mas'ud was very grateful. Al-Biruni was given a silver coin. The sultan gave very much gifts. Moreover, it took elephants to bring the gifts. But Al-Biruni refused.

"Sorry, it would be better that the silver coins are handed over to the Baitul Mal," he said. "Why?" Asked the Sultan.



Al-Biruni menolak hadiah yang banyak itu. Dia justru ingin rakyat yang menikmatinya. Oleh sebab itu, Al-Biruni memilih diserahkan pada Baitul Mal agar hadiah itu bisa dibagi-bagikan.

Al-Biruni tidak butuh kekayaan sebanyak itu. Dia biasa hidup dalam kesederhanaan. Akhirnya, sultan pun menerima keputusan Al-Biruni.

Al-Biruni refused many gifts. He just wanted people to enjoy it. Therefore, Al-Biruni chose to be handed over to the Baitul Mal so that the prize could be distributed.

Al-Biruni did not need that much wealth. He used to live in simplicity. Finally, the sultan accepted Al-Biruni's decision.

Al-Qanun al-Masudi fii al-Haiwa al-Nujum menjadi makin terkenal. Buku ini menjadi rujukan penting ilmuwan astronomi dunia. Buku ini membimbing orang memahami langit dan segala isinya.

Ilmuwan Eropa menerjemahkan *Al-Qanun* menjadi *Canon Mas'udicus*. Buku ini menerangkan cara perhitungan gerakan planet-planet. Bahkan, buku ini dengan akurat mengukur jarak bumi ke matahari sehingga bisa memperbaiki kekeliruan ilmuwan sebelumnya.

Al-Qanun al-Masudi fii al-Haiwa al-Nujum becomes famous tremendously. This book is an important reference for the world astronomy scientists. This book guides people to understand the sky and everything in it.

European scientists translated *Al-Qanun* into the *Canon Mas'udicus*. This book explains how to calculate the movements of the planets. In fact, this book accurately measures the distance of the earth to the sun so that it can correct previous scientific errors.





Metode Eksperimen

Experiment Method



Al-Biruni seorang ilmuwan yang menyukai eksperimen. Berbagai uji coba dan pengamatan langsung dilakukannya. Al-Biruni ilmuwan pertama yang melakukan eksperimen astronomi. Dengan sabar dia mengamati gerhana bulan di Khurasan. Setiap proses gerhana bulan dijelaskan dengan rinci.

Pengamatannya berlanjut kepada benda-benda langit lainnya. Hasilnya, Al-Biruni dapat menjelaskan posisi bintang-bintang. Apa pentingnya posisi bintang-bintang? Ini berguna sebagai petunjuk pelayaran dan perjalanan.

Al-Biruni was a scientist who likes experiments. Various experiments and direct observations were carried out. Al-Biruni was the first scientist to conduct an astronomical experiment. He patiently observed the lunar eclipse in Khurasan. Each lunar eclipse process was explained in detail.

His observation continued with other celestial objects. As a result, Al-Biruni could explain the position of the stars. What is the importance of the star position? This is useful for navigation on sea voyage and travel guide.

Kecerdasannya terlihat dari kemampuan mengamati alam. Walaupun tanpa peralatan canggih, dia berhasil menerangkan pergerakan matahari secara jelas.

Al-Biruni pula ilmuwan pertama yang menyebut bumi berotasi. Maksudnya, bumi berputar pada sumbunya. Pendapatnya itu berbeda dengan ilmuwan di masa itu hingga di kemudian hari ilmuwan modern mengakui kebenaran Al-Biruni.

His intelligence can be seen from the ability to observe nature. Even without sophisticated equipment, he managed to explain the sun's movements clearly.

Al-Biruni was also the first scientist to call the earth is rotating. That is, the earth rotates on its axis. His opinion was different from scientists at that time until later modern scientists recognized the truth of Al-Biruni.



Dari pengalaman meneliti ia menyadari perlunya peralatan sehingga sejumlah peralatan astronomi berhasil diciptakannya. Al-Biruni merancang pembuatan astrolab atau alat navigasi. Ia pula yang pertama merancang sextant untuk mengukur jarak matahari, bulan dan bintang.

Al-Biruni juga menciptakan instrumen hodometer. Dia yang memperkenalkan mesin untuk memproses data. Caranya dengan menggunakan kalender lunisolar mekanik.

From research experience he realized the need for equipment so a number of astronomical equipment was successfully created. Al-Biruni designed the astrolabes or navigation devices. He was also the first to design a sextant to measure the distance of the sun, moon and stars.

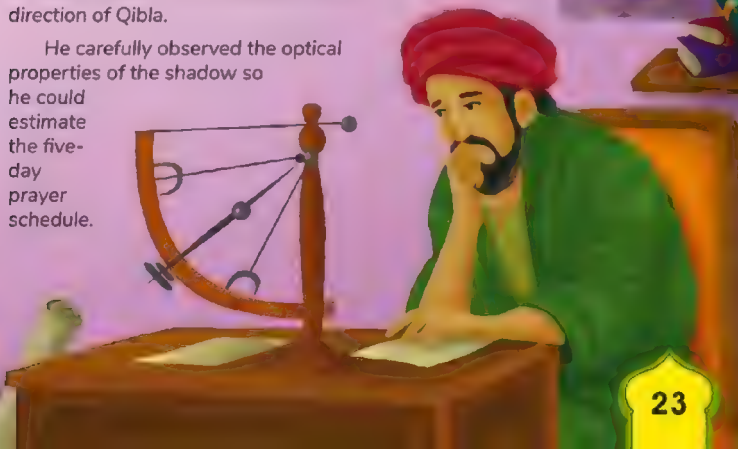
Al-Biruni also created a hodometer instrument. He was the one who introduced the machine to process the data. By using a mechanical lunisolar calendar.


Instrumen astronomi Al-Biruni sangat membantu umat Islam, terutama peralatannya dapat menunjukkan arah kiblat salat. Dia telah melalui ratusan kota. Di setiap kota ia memperhitungkan garis lintang dan bujur sehingga Al-Biruni dapat menunjukkan arah kiblat yang benar.

Dengan teliti dia mengamati sifat optik dari bayangan sehingga ia dapat memperkirakan jadwal salat lima waktu.

Al-Biruni's astronomical instruments are very helpful for Muslims, especially the equipment can show the direction of prayer. He has been gone through hundreds of cities. In each city he calculated latitude and longitude so that Al-Biruni could show the correct direction of Qibla.

He carefully observed the optical properties of the shadow so he could estimate the five-day prayer schedule.






Sekarang manusia mengamati langit dengan teleskop. Padahal, teleskop itu terbantu oleh peralatan yang dibuat Al-Biruni. Dia menciptakan tabung observasi yang tidak memakai lensa. Hebatnya, tabung observasi itu mampu dipakai melihat benda langit.

Selain itu, tabung observasi memiliki keistimewaan dapat menepis gangguan cahaya saat melihat angkasa sehingga mata manusia nyaman melihat benda-benda langit.

Now humans observe the sky with a telescope. In fact, the telescope was helped by the equipment made by Al-Biruni. He created an observation tube that didn't use a lens. Amazingly, the observation tube was able to be used to see celestial bodies.

In addition, the observation tube has the privilege of being able to ward off the light disturbances when viewing space so that the human eye is comfortable to see the celestial objects.



Al-Biruni membuktikan dirinya ilmuwan yang saleh. Dia yakin Tuhan memberi manfaat dari penciptaan langit. Al-Biruni selalu bersandar kepada eksperimen ilmiah. Dia menolak astrologi atau ramalan nasib manusia dengan bintang-bintang.

Ramalan bintang seperti itu hanya berdasarkan praduga saja. Nasib manusia tidak ditentukan oleh bintang-bintang. Hal itu bertentangan dengan ajaran Islam.


Al-Biruni proved himself a pious scientist. He believed God gave benefits from the creation of the sky. Al-Biruni always relied on scientific experiments. He rejected astrology or the prediction of human destiny with stars.

Such horoscope is only based on presumption. The fate of humans is not determined by the stars. That contradicts to the Islamic teachings.



Reliling Bumi

The Circumference of Earth

An illustration of a man with a red turban and a green robe, identified as Al-Biruni, looking upwards with his right hand raised towards a diagram. The diagram shows a curved path representing the Earth's circumference, with yellow stars or points along it. The background is a deep blue sky with more stars.

Bumi merupakan karunia Allah yang menarik perhatian Al-Biruni. Dia melakukan berbagai eksperimen mempelajari keunikan bumi. Syukurnya Al-Biruni menguasai berbagai bidang keilmuan sehingga berhasil melakukan hal-hal yang luar biasa.

Saat berusia 17 tahun, Al-Biruni telah melakukan sesuatu yang mencengangkan. Dia berhasil menghitung ketinggian kota Kath.

Earth is a gift from Allah that attracted Al-Biruni's attention. He carried out various experiments studying the uniqueness of the earth. Fortunately, Al-Biruni's mastered various scientific fields so that he succeeded in doing extraordinary things.

When he was 17 years old, Al-Biruni had done something amazing. He managed to calculate the height of Kath city.

Saat itu bumi belum diketahui manusia keseluruhannya. Namun Al-Biruni sudah tahu bumi itu bulat. Dia berhasil menghitung ukuran diameter bumi meskipun kurang beberapa kilometer saja.

Bedanya, ilmuwan modern memakai peralatan supercanggih, sedangkan Al-Biruni menghitung dengan kecerdasan otaknya. Luar biasa cerdasnya Al-Biruni!

At that time the whole earth was unknown to humans. But Al-Biruni already knew the earth was round. He managed to calculate the diameter size of the earth even though it was less few kilometers only.

The difference is, modern scientists use super-sophisticated equipment, while Al-Biruni calculates with his brain intelligence. How incredible Al-Biruni's intelligence!




Orang-orang zaman dulu sudah berusaha mengukur diameter bumi. Mereka mencermati terus menerus matahari di dua lokasi berbeda. Cara ini membuat hitungan diameter bumi meleset jauh. Lalu bagaimanakah cara Al-Biruni menghitungnya? Al-Biruni menciptakan cara yang sekarang disebut trigonometri.

Dia menghitung sudut antara suatu tempat di dataran rendah dengan puncak gunung. Cara ini menghasilkan perhitungan yang lebih tepat. Selain itu juga cukup dilakukan seseorang dari satu tempat saja.



The ancients had tried to measure the diameter of the earth. They looked closely at the sun from two different locations. This method made the earth's diameter count inaccurate. Then how did Al-Biruni count it? Al-Biruni created the method which now called trigonometry.

He calculated the angle between a place in the lowlands and the top of a mountain. This method generated a more precise calculation. Besides that, it needs only one person and from one place only.



Sederhana cara Al-Biruni mengukur diameter bumi agar lebih akurat. Terlebih dahulu ia mencari sebuah bukit di tepi laut. Al-Biruni menggunakan astrolabe untuk menghitung sudut ketinggian bukit dari dua titik permukaan air laut yang berbeda.

Al-Biruni lalu naik ke puncak bukit. Dengan astrolabnya, dia mengukur sudut ketinggian garis pandang di bawah horizon yang tampak dari puncak bukit.

Al-Biruni measured simply the diameter of the earth to be more accurate. First he searched for a hill by the sea. Al-Biruni used the astrolabe to calculate the height angle of the hill from two different sea level points.

Al-Biruni then climbed to the top of the hill. With his astrolabe, he measured the angle of sight line below the horizon that appeared from the top of the hill.

Al-Biruni mempunyai imajinasi yang dahsyat. Titik puncak bukit dan ufuk langit dapat dibayangkan terhubung dengan titik tengah bumi sehingga terbentuklah segitiga siku raksasa.

Di sinilah digunakan hukum sinus, Al-Biruni menghitung dengan persamaan gabungan trigonometri dan aljabar agar dapat menghitung jari-jari dan keliling bumi.

Al-Biruni had a great imagination. The hilltops and sky horizons can be imagined to be connected to the midpoint of the earth so that a giant right-angled triangle is formed.

This is where the sine law is used, Al-Biruni calculated the combined trigonometric and algebraic equations in order to calculate the radius and circumference of the earth.

Al-Biruni juga menulis buku lain yang tak kalah mencengangkan. Judul bukunya *Tahdid Nihayat Al-Amakin Li Tashih Masafat Al-Masakin*. Buku itu menerangkan koordinat tempat dan manfaatnya untuk mengoreksi hitungan jarak antar kota.

Buku ini mencengangkan karena Al-Biruni memuat peta dunia. Dia menerangkan bukti-bukti adanya laut luas di timur dan barat. Lautan yang luas itu diyakininya saling terhubung. Pada peta bumi miliknya, daratan bumi dikelilingi lautan luas.

Al-Biruni also wrote another book which was no less astonishing. The title of his book was *Tahdid Nihayat Al-Amakin Li Tashih Masafat Al-Masakin*. The book explains the coordinates of the place and its benefits to correct the distance count between cities.

This book was astonishing because Al-Biruni put a map of the world. He explained the evidence there are vast sea in the east and west. The vast ocean is believed to be interconnected. On his earth map, the land of the earth is surrounded by vast oceans.



Saat itu sulit sekali bagi orang lain memahami maksudnya. Belum ada pesawat terbang yang mampu mengelilingi dunia. Belum ada teknologi canggih untuk mengetahui keseluruhan bumi. Anehnya, Al-Biruni sudah menjelaskan hal tersebut dengan baik.

Pada zaman modern orang-orang membuktikan kebenarannya. Ternyata di bumi ini ada lautan Pasifik, Atlantik dan Hindia. Itulah yang dimaksud Al-Biruni berabad-abad yang lampau.

At that time it was very difficult for other people to understand the point. There was no aircraft which able to go around the world. There was no advanced technology to know the whole earth. Strangely, Al-Biruni explained this well.

In modern times people prove the truth. It turns out that on this earth there are Pacific, Atlantic and Indian oceans. That was what Al-Biruni meant centuries ago.

Matematika dan Fisika

Mathematics and Physics

Al-Biruni terkenal sebagai jagoan matematika. Ilmu ini memudahkan dirinya mengembangkan ilmu lainnya. Matematika ibarat cahaya untuk mendapatkan pengetahuan baru. Keberhasilannya mengukur diameter bumi berkat matematika.

Dia memang mencintai matematika. Bukan hanya menguasainya, tapi dia juga menghasilkan rumus. Sampai di zaman modern rumus matematikanya tetap dipakai.

Al-Biruni was famous as a mathematician. This science eased him to develop other sciences. Mathematics is like a light to get new knowledge. His success to measure the diameter of the earth because of mathematics.

He loved mathematics. Not only mastered it, but he also generated formulas. Until modern times his mathematical formula is still used.

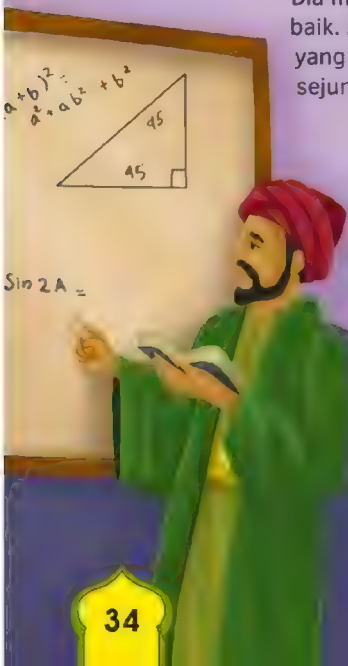


Dunia mengenal aljabar, geometri, trigonometri, kalkulus dan aritmatika. Semua itu berkat kecintaan Al-Biruni pada matematika. Dia mulai menggambar pada permukaan sebagai bagian geometri. Al-Biruni yang pertama mengenalkan konsep tangen dan kotangen. Rumus kalkulus dari Tsabit bin Qurah sempat membingungkan. Kemudian dibuktikan kebenarannya oleh Al-Biruni.

Dia memperhatikan matematika kuno dengan baik. Al-Biruni menguasai sejarah angka India yang berpindah ke Arab. Dia juga menulis sejumlah buku aritmatika.

The world knows algebra, geometry, trigonometry, calculus and arithmetic. All of them because of Al-Biruni's devotion of mathematics. He started drawing on the surface as part of the geometry. Al-Biruni was the first to introduce the concept of tangent and cotangent. The calculus formula of Thabit bin Qurah was a bit confusing. Then the truth was confirmed by Al-Biruni.

He watched ancient mathematics well. Al-Biruni mastered the history of Indian numbers that moved to Arabia. He also wrote a number of arithmetic books.

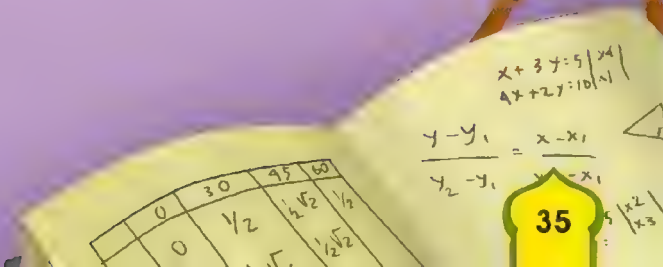


Dalam bidang fisika, Al-Biruni juga berjasa besar. Kita bisa berjalan di atas bumi dan melompat balik lagi ke bumi karena adanya gravitasi. Apapun yang dilempar ke atas akan kembali lagi ke bawah.

Sekarang kita mengenalnya dengan gaya gravitasi. Semenjak dahulu Al-Biruni telah menjelaskan hal ini. Dia menerangkan adanya daya yang menarik benda ke pusat bumi. Kelebihan bumi ini tidak dimiliki oleh planet lainnya.

In the field of physics, Al-Biruni also contributed greatly. We can walk on the earth and jump back to earth because of gravity. Whatever is thrown up will come back down again.

Now we know it by gravity. Ever since, Al-Biruni has explained this. He explained the power that pulled objects to the center of the earth. This is superiority of earth which not owned by other planets.



The sticky note contains handwritten mathematical work. At the top, there are two linear equations: $x + 3y = 5$ and $4x + 2y = 10$. Below these, the slope formula is written as $\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$. To the right of the formula is a small triangle diagram. At the bottom left is a table with numerical values. To the right of the table is a yellow starburst shape containing the page number 35. Further to the right, there are handwritten expressions $\frac{1}{2} \times 2$ and $\frac{1}{2} \times 3$.

	0	30	45	60
		$\frac{1}{2}$	$\frac{1}{2}\sqrt{2}$	$\frac{1}{2}$
0			$\frac{1}{2}\sqrt{2}$	
				$\frac{1}{2}\sqrt{2}$

Al-Biruni mengadakan eksperimen statika dan dinamika. Dia ilmuwan pertama yang melakukannya. Dari itu pula, dia bisa mengukur berat spesifik.

Al-Biruni rajin melakukan berbagai eksperimen sehingga dapat membedakan berat air tawar dan air laut. Begitu juga ia bedakan antara air panas dengan air dingin.

Al-Biruni carried out statics and dynamics experiments. He was the first scientist to do it. From that, he could measure specific weight.

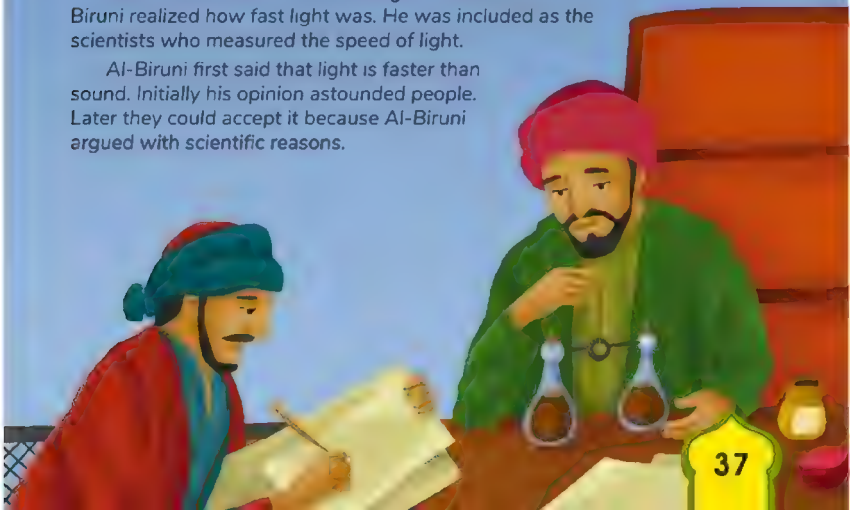
Al-Biruni diligently conducted various experiments so that he could distinguish the weight of fresh water and sea water. He also distinguished between hot water and cold water.

Semua manusia normal dapat melihat cahaya. Namun, Al-Biruni menyadari betapa cepatnya cahaya. Dia termasuk ilmuwan yang mengukur kecepatan cahaya.

Al-Biruni yang pertama mengatakan cahaya lebih cepat dari suara. Awalnya pendapat-pendapatnya mencengangkan orang. Di kemudian hari mereka dapat menerimanya karena Al-Biruni berpendapat dengan alasan ilmiah.

All normal human can see the light. However, Al-Biruni realized how fast light was. He was included as the scientists who measured the speed of light.

Al-Biruni first said that light is faster than sound. Initially his opinion astounded people. Later they could accept it because Al-Biruni argued with scientific reasons.





Guru Segala Ilmu

Master of All Sciences

Al-Biruni mendapat julukan "Guru Segala Ilmu."

Julukan ini bukti penghormatan terhadap ilmunya karena dia menguasai banyak sekali bidang keahlian. Al-Biruni pakar sejarah, geografi, geodesi, geologi dan antropologi.

Dia juga pakar matematika, fisika, astronomi dan lainnya. Hebatnya, Al-Biruni juga seorang ahli dalam ilmu keagamaan. Hidupnya dihabiskan untuk menuntut ilmu, berpetualang, dan mengajar.

Al-Biruni was dubbed as "Master of All Sciences." This name is proof of reverence for his knowledge because he mastered many fields of expertise. Al-Biruni was an expert in history, geography, geodesy, geology and anthropology.

He was also an expert in mathematics, physics, astronomy and others. Amazingly, Al-Biruni was also an expert in religious science. His life was spent on studying, adventuring, and teaching.

Selain rajin meneliti, Al-Biruni juga rajin menuliskannya. Ratusan buku sudah ditulis sepanjang hayatnya. Al-Biruni menulis berbagai bidang keilmuan. Dia menulis 35 buku astronomi, 4 buku astrolab, 9 buku geografi, dan 10 buku geodesi atau pemetaan. Dia juga menghasilkan 15 buku matematika dan 2 buku mekanika.

Al-Biruni menulis 2 buku farmasi, 1 buku meteorologi, dan 2 buku mineralogi. Selain itu, ada 4 buku sejarah, 2 buku tentang India, dan 3 buku agama serta filsafat.

Besides observing diligently, Al-Biruni also wrote it down diligently. Hundreds of books have been written throughout his life. Al-Biruni wrote various scientific fields. He wrote 35 astronomical books, 4 astrolab books, 9 geography books, and 10 geodesic or mapping books. He also produced 15 math books and 2 mechanics books.

Al-Biruni wrote 2 pharmacy books, 1 meteorological book, and 2 mineralogical books. In addition, there are 4 history books, 2 books on India, and 3 books on religion and philosophy.

Sungguh tidak mudah mencari ilmuwan serba bisa seperti Al-Biruni. Di penghujung hayat, ia masih mendalami ilmu farmasi. Al-Biruni menulis buku *Al-Saydanah fi Al-Thib*. Itu yang membuatnya disebut Bapak Farmasi Islam.

Buku itu mengkaji penyebab munculnya penyakit dan penjelasan tentang obat-obatan sebagai penyembuhnya. Obat-obatan itu berasal dari tumbuhan dan juga hewan.

Indeed, it's not easy to find multi-talented scientist like Al-Biruni. At the end of his life, he still studied pharmacy. Al-Biruni wrote the book *Al-Saydanah fi Al-Thib*. That made him called as the Father of Islamic Pharmacy.

The book examines the causes of the emergence of diseases and the explanation of drugs as the cure. The medicines come from plants and animals.

Beruntunglah Al-Biruni yang gemar berpetualang. Di setiap negeri yang disinggahinya, dia mengamati tanaman. Al-Biruni mempelajari dengan baik khasiat setiap tumbuhan.

Ada ribuan jenis tumbuhan yang dicantumkan di buku farmasinya. Untuk memudahkan orang lain, di bukunya juga dituliskan lokasi tumbuhan obat tersebut. Al-Biruni tidak menutup-nutupi obat-obatan karena dia ingin orang lain hidup sehat.

Fortunately Al-Biruni loved adventure. In each country he visited, he observed plants. Al-Biruni studied well the efficacy of every plant.

There are thousands types of plants listed in his pharmacy book. To make it easier for others, it was also written the location of the medicinal plants in his book. Al-Biruni did not hide the drugs because he wanted others to live healthy.



Al-Biruni wafat pada 13 Desember 1048 M di Ghazna. Ilmuwan itu meninggal dunia di usia 75 tahun. Hingga saat ini dia memperoleh banyak penghormatan dari dunia. Pihak Barat menyebutnya The Extraordinary Genius of Universal Scholar atau Ilmuwan Dunia yang Luar Biasa Jenius.

Sebuah kawah di bulan diberi nama The Biruni Crater. Ilmuwan astronomi memberi nama itu untuk menghormati Al-Biruni. Ini suatu penghormatan yang luar biasa. Tidak cukup di bumi, nama Al-Biruni juga ada di bulan.

Al-Biruni died on December 13, 1048 AD in Ghazna. The scientist died at the age of 75. Until now he has received much respect from the world. The West calls him The Extraordinary Genius of Universal Scholar.

A crater on the moon is named The Biruni Crater. Astronomical scientists named it to honor Al-Biruni. This is an extraordinary honor. Not only on earth, the name of Al-Biruni also existed on the moon.



Daftar Pustaka

Amandra Mustika Megarani et.al., *Kilau Mutiara Sejarah Nabi*, Jakarta, Tempo, 2013.

Fajriudin, *Historiografi Islam: Konsepsi dan Asas Epistemologi Ilmu Sejarah dalam Islam*, Jakarta, Prenada Media, 2018

Najichah, *Biografi Tokoh Ilmuwan Dunia*, Jakarta, Balai Pustaka, 2012

Wulan Mulya Pratiwi, et.al. *55 Tokoh Dunia yang Terkenal & Paling Berpengaruh Sepanjang Zaman*, Yogyakarta, Scritto Books Publisher, 2018

<https://aliboron.wordpress.com>

<https://www.gomuslim.co.id>

<https://kisahmuslim.com>



Profil Penulis

Penulis buku ini bernama **Yoli Hemdi**. Kak Yoli lahir tanggal 4 Juli di Pekanbaru, Riau. Tapi Kak Yoli adalah putera asli suku Minang, di Sumatera Barat. Hobinya jalan-jalan ke berbagai tempat indah di dunia. Kak Yoli gemar sekali menulis berbagai jenis buku. Kini perhatiannya lebih besar kepada buku anak-anak.

Kak Yoli Hemdi ikut mendirikan The Superteacher Institute yang sangat perhatian memajukan pendidikan. Kak Yoli sangat suka berteman. Kalau adik-adik mau bersilaturahmi, silahkan kirim e-mail ke: superteacher7@yahoo.com.

Profil Editor

Aang Sonhaji memasuki dunia penerbitan sejak tahun 2008. Lulus sebagai Sarjana Pertanian dari Universitas Jenderal Soedirman (Unsoed) tahun 2005, Beberapa buku yang telah dikerjakan antara lain: *Belajar Mengenai Kecerdasan Mental, Buku Seri Pramuka untuk Golongan Siaga, Penggalang, dan Penegak (Total 11 buku), Mari Beternak Ayam Arab, Sistem Pencernaan Manusia, Seri Pengetahuan Antariksa: Penjelajahan Ruang Angkasa, Buku Siswa dan Buku Guru Biologi untuk SMA/Madrasah Aliyah Kelas X Kurikulum 2013*, dan lain sebagainya. Editor dapat dihubungi di e-mail: a4nk.wie@gmail.com

Profil Penerjemah

Nur Lailatur Rofiah lahir di Gresik pada 24 Januari. Memulai karir sebagai penerjemah setelah lulus *Master of English* dari *Aligarh Muslim University*, India. Hobinya berenang, membaca dan jalan-jalan. Kak Laila mendirikan ELLI – *The Education of Literature and Linguistics Institute* untuk meningkatkan literasi dan pengembangan bahasa asing di kalangan anak-anak di sekitarnya.

Kak Laila mengajar di Walailak University Language Institute – Thailand. Kak Laila bisa dihubungi di e-mail: ellieducation.institute@gmail.com

Profil Ilustrator

Joy Subarjah aktif di dunia penerbitan sebagai Ilustrator sejak tahun 2000. Lulus SI Seni Rupa UPI Bandung. Beberapa hasil karyanya pernah diterbitkan antara lain: *Ilmuwan Muslim, Dongeng Sains, Kisah Tiko Tidut, Kisah Al-quran, Fabel Karakter (Fakar) Seri Binatang Asli Indonesia*, dan lain sebagainya. Joy dapat dihubungi di e-mail: joy.subarjah@gmail.com

Yusuf M. Suriawinata (Yoes) aktif di dunia penerbitan sebagai Desain Cover sekaligus Ilustrator sejak tahun 2006. Pernah bekerja di animasi, Innerchild studio, dan Nalar Studio. Lulus SI Seni Rupa UPI Bandung. Beberapa hasil karyanya yang pernah diterbitkan antara lain: *Ghost Walk, Kelopak Cinta Kelabu, Menyelamatkan Bangkai Kapal, Sherryl Woods A Slice of Heaven, Kunci Surga bagi Muslimah, Kisah Seru Nabi Muhammad, Pesta Langit, Fabel Karakter (Fakar) Seri Binatang Asli Indonesia*, dan lain sebagainya. Yusuf dapat dihubungi di email ymsuriawinata@gmail.com



Profil Layouter

Edi Sukmana (Edi Laish) aktif di dunia penerbitan sejak tahun 2002. Lulus DIII Editing UNPAD Bandung. Beberapa hasil karyanya yang pernah diterbitkan antara lain: *BTCLS & Disaster Management*, *Study Mandiri di Amerika Serikat*, *Doa Harian Anak Muslim*, *Fabel Karakter (Fakar) Seri Binatang Asli Indonesia*, *Media Batununggal*, dan lain sebagainya. Edi dapat dihubungi di e-mail: edilaish@gmail.com

Profil Desain cover

Muchlis Umar lahir di Jakarta. Ia adalah anak Betawi asli yang dari kecil hobi menggambar. Kesukaannya di bidang 'gambar menggambar' membuatnya dipercaya menjadi salah satu desainer di Gema Insani Press sejak tahun 1998. Sejak saat itu Kak Muchlis dengan 'dr. Desain'-nya dipercaya juga sebagai desainer freelance di beberapa penerbit. Tahun 2014 Kak Muchlis diminta mengajar desain grafis di PKPU Depok. Beliau juga suka mengajar anak-anak menggambar loohh... biasanya saat SanLat Romadhon. Kak Muchlis dapat dihubungi di e-mail: mcsumar@gmail.com